

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



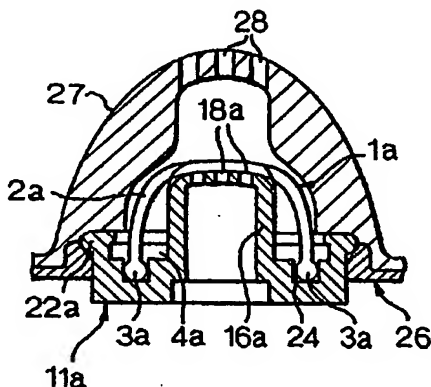
(43) International Publication Date
24 December 2003 (24.12.2003)

PCT

(10) International Publication Number
WO 03/105635 A1

- (51) International Patent Classification⁷: A47G 19/22, B65D 47/20, F16K 15/14
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- (21) International Application Number: PCT/GB03/02565
- (22) International Filing Date: 13 June 2003 (13.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
0213594.5 14 June 2002 (14.06.2002) GB
0300994.1 16 January 2003 (16.01.2003) GB
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KB, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
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- Published:
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A VALVE



(57) Abstract: A valve for liquids or fluent materials comprising a flexible valve member disposed over one or more apertures in a relatively non-flexible valve seat; wherein, when suction is applied to the face of the flexible valve member remote from the valve seat or pressure is applied to the face of the flexible valve member nearest to the valve seat, the flexible valve member will be flexed off the valve seat and permit liquid or fluent material to flow through the or each aperture but the flexible valve member will flex back to lie over and close the or each aperture to seat the same when the suction or pressure is released.

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A VALVE

5 The invention relates to a valve for liquids and fluent materials such as creams and pastes, also known as a non-spill valve because it is particularly suitable for domestic applications where the liquid or fluent material is sucked or pressed out of a container but substantially nothing escapes from the container when the suction or pressure stops.

10 The valve of the invention has been designed in particular for the lids of trainer cups for children after they have been weaned from the breast or feeding bottle. Such trainer cups are invariably carelessly held obliquely by the toddler when not in use or laid down sideways instead of upright or they are shaken vigorously. It is therefore desirable to provide the lid of the cup with a valve which avoids
15 spillage but is nevertheless easy to operate when the child sucks on a spout provided on the lid.

Known constructions have made use of a slit valve of flexible material, in which the slit opens under suction and the material flexes
20 shut at other times. Although flexible slit valves are generally satisfactory, they are necessarily made from a flexible plastics material which is sensitive to high temperatures and cannot therefore be steam cleaned or boiled. Also, it is difficult to make simple adjustments to enable the valves to be modified to suit the suction applied by toddlers
25 of different ages or to adapt the valves to different uses, such as pressure valves.

According to an aspect of the present invention, there is provided a valve for liquids or fluent materials comprising a flexible valve

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strip disposed over an aperture in a relatively non-flexible valve seat; wherein, when suction is applied to the face of the strip remote from the valve seat or pressure is applied to the face of the strip nearest to the valve seat, the strip will be flexed off the valve seat and permit
5 liquid or fluent material to flow through the or each aperture but the strip will flex back to lie over and close the or each aperture to seal same when the suction or pressure is released.

It will be evident, therefore, that the valve of the invention functions
10 as a non-return valve when used either as a suction valve or as a pressure valve insofar that it will not allow flow in the direction opposite to that intended. For example it will not allow a child to blow bubbles into the cup. However, the main purpose of the valve according to the invention is to avoid spillage and to permit one and
15 the same valve construction to be employed as a suction valve or as a pressure valve without requiring major redesigning.

Preferably, in the case of a valve for trainer cups, the valve strip is wrapped about a valve holder or retaining ring surrounding an
20 apertured hollow post of the valve seat. The strip and valve holder can therefore be pre-assembled and this assembly can be connected to the valve seat to form a unit which is subsequently sealed in an emplacement formed in the lid of the cup beneath a spout through which the child sucks.

25 The invention extends to vessels and containers, and especially lidded trainer cups, fitted with the above-mentioned non-spill valve.

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In a further aspect, the invention provides a valve, or a vessel including any one or more of the novel features or combination of features disclosed herein.

5 Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

10 Figure 1 is a side elevation view of a valve member;

Figure 2 is a plan view of a valve member;

Figure 3 is a top plan view of a valve holder;

15 Figure 4 is a side elevation view of a valve holder;

Figure 5 is a bottom plan view of a valve holder;

20 Figure 6 shows a sectional view along the line A-A of Figure 3;

Figure 7 shows a sectional view along the line B-B of Figure 3;

Figure 8 is a view of a valve seat;

25 Figure 9 is a side elevation view of a valve seat;

Figure 10 is a bottom plan view of a valve seat;

Figure 11 shows a sectional view along the line A-A of Figure 8;

30 Figure 12 shows a sectional view along the line B-B of Figure 8;

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Figure 13 is a partial cross-section of a trainer drinking cup;

Figure 14 is a top plan view of a trainer drinking cup;

5 Figure 15 is a front elevation view of the lid of Figures 13 and 14;

Figure 16 is a partial cross-section of the lid shown of Figures 13 to 15 incorporating the valve of the present invention;

10 Figures 17 and 18 are respectively a front and side cross-section through another embodiment of the valve;

Figures 19 and 20 are respectively a partial side elevation and bottom plan view of an alternative valve seat;

15 Figure 21 shows an exploded perspective view of an alternative lid for a trainer cup incorporating the valve of the present invention;

Figure 22 is a bottom plan view of the lid of Figure 21; and

20 Figure 23 is an underside perspective view of the lid of Figure 21 in an assembled condition.

Figs. 1 and 2 illustrate a valve member 1 of flexible and preferably
25 plastics material comprising a rectangular strip 2 terminating in thickened and widened anchoring portions 3. Figs. 3 to 7 show a preferably plastics valve holder 4 for the valve member 1. The valve holder 4 is not flexible. It comprises a ring 6 of which the hole 7 is wider than the width of strip 2. The ring has depending side walls 5.
30 In the illustrated case, the ring is oval and the ends are formed with

- 5 -

notches 8 of a depth substantially equal to the thickness of the strip 2 of the valve member 1. When assembled, the strip 2 of valve member 1 overlies the ring 6 of holder 4 as shown in chain-dotted lines in Fig. 3 and passes through the notches 8, the thickened and widened anchoring portions 3 (not visible in Fig. 3) being tucked under the ring and held in place on its underface between the side walls 5.

In a modification (not illustrated), the ring 6 of valve holder 4 is of stiff plastics material and co-moulded with a flexible valve strip to replace a separate valve member 1 that has to be assembled with the valve holder 4. Nowadays, co-moulding is not a difficult technique for bonding stiff and soft plastics materials to each other. Such co-moulding would do away with the need for side walls 5 and notches 8 for the holder 4 and thickened and widened anchoring portions 3 on the valve member 1.

The assembly of valve member 1 and holder or retaining ring 4 co-operates with a valve seat generally indicated at 11 in Figs 8-12 and also visible in Fig. 16. This valve seat comprises a body portion 12, here oval in shape, a semi-oval skirt 13 depending therefrom and a handle 14. The body portion carries an upstanding hollow post 16 of oval cross-section closed at its top by a wall 17 but provided in the wall 17 with at least one aperture 18 and preferable at least two apertures or even three. The wall 17 at the top is curved longitudinally of the oval and carries four projections 20. The body portion 12 contains a central cavity 19 and of course the post 16 extends right down to the base of the cavity. The cavity 19 is larger than the cross-sectional dimensions of the post 16 to define a channel 21 surrounding the post 16.

30

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Before the valve is applied to the lid of a trainer cup as will hereinafter be described, the valve holder 4 carrying the valve member 1 is assembled with the valve seat 11. This is simply done by threading the ring 6 of the holder 4 with its oval hole 7 over the post 16. In so doing, the strip 2 of the valve member 1 wrapped over and under the ring 6 becomes positioned in an emplacement defined by the projections 20 of the post 16 and become taut over the curved top wall 17, the thickened and enlarged anchoring portions 3 at the ends of the strip 2 becoming trapped beneath the ring 6 and the bottom of the
10 aforementioned channel 21 in the valve seat. The dimensions of the ring 6 are such that it is a push fit in the channel 21 of cavity 19 and also a push fit on the post 16. When pushed home, the side walls 5 of the valve holder 4 rest on the bottom of the cavity 19 of the valve seat 11 and the valve member 1 seals the holes 18 in the top of the post 16.

15 It will now be apparent that, if suction is applied to the exposed face of the strip 2 of the valve member 1 from above as viewed in Fig. 3, the strip will be flexed to lift off the top wall 17 of the post 16 of the valve seat 11 and the holes 18 will be opened to permit liquid to flow
20 through the post and out through the holes 18. As soon as suction is released, the strip 2 will flex back again to shut the holes 18. The same result will be achieved if pressure is applied to the strip 2 by pushing fluent material upwardly through the post 16.

25 The amount of suction or pressure, that is to say pressure differential, required to flex the strip 2 off the holes 18 depends on the pre-stress applied to the strip 2 during assembly, which is governed by the length of the strip 2 between the thickened and widened anchoring portions 3. It also depends on the material used for the valve member 1, the
30 thickness of the strip 2, the size of the holes 18 in the top wall 17 of

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the hollow post 16 and the height of the post. All these factors can therefore be utilised to vary the suction or pressure required to displace the valve member 1. The preferred materials for all the parts are plastics, best of all silicone for the valve member 1, polycarbonate for the valve seat 11 with handle 14 and likewise polycarbonate for the valve holder 4.

The assembled valve thus far described is intended to be used for a trainer cup for toddlers who are not yet proficient at drinking from beakers or ordinary cups. Such trainer cups 25 (Fig. 13) are provided with a lid 26 having a spout 27. The spout is made of relatively soft material moulded to the lid over a hole in the lid and it has one or more apertures 28 through which the child can suck. When it stops sucking, the cup is supposed to be leakproof and for this purpose the spout is fitted with the previously described non-spill valve. Referring to Fig. 16, this illustrates the assembly of valve seat 11 and valve member 1 (the valve holder is not visible) in place within the spout 27 and engaged therein with a hermetic sealing fit. It is preferably a removable snap fit in the spout, for which purpose the valve seat 11 is provided with a circumferential bead 22 (also see Figs. 11 and 12) engaging in a complementary groove inside the spout. The handle 14 on the valve seat 11 permits the valve assembly to be easily pulled out of the lid 26 for cleaning purposes.

As an optional feature, the ingress of air to facilitate rapid reduction of vacuum within the cup when the child is no longer sucking may be permitted through an air vent in the form of a pin hole (not shown) in the soft extension 27' of the material of spout 27 (Fig. 16). The pin hole overlies a hole in the lid 26 and is normally closed by a pin or pimple on the top of the handle 14 at a position remote from the body

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portion 12 of the valve seat 11. Figs. 19 and 20 illustrate a modified valve seat 11b with handle 14b showing the pin 31 just referred to. When there is excessive vacuum within the cup, the pimple on the handle will become very slightly dislodged from the air vent or pin
5 hole to permit air to enter but there is insufficient room for liquid to escape.

Figs. 19 and 20 also show that the handle 14 may be provided with an enlargement 32. This co-operates with a guide channel (not shown)
10 on the underface of the lid 26 to help keep the valve seat in position. The enlargement 32 may be a snap fit in its guide channel.

It has been found that the valve according to the invention is ideal for preventing spillage from the cup, even if the cup is laid on its side or
15 held upside down or is shaken vigorously.

A modification of the valve construction is illustrated in Figs. 17 and 18 but the principle remains the same and therefore the same reference numerals have been used for equivalent parts but with the suffix a.

The soft spout on the relatively rigid lid 26 of the cup is again
20 indicated at 27 and the holes are at 28. The main difference resides in the manner in which the silicone valve member 1a is held taut on the hollow post 16a of the polypropylene valve seat 11a to cover the holes 18a (of which there are this time three instead of just two or, better
25 still a single slot). The retaining member or valve holder 4a is in this construction a snap fit in the cavity surrounding the post 16a and defines with the base of that cavity two grooves 24 in the which the thickened end portions 3a of the valve strip 2a are trapped. The valve
30 seat 11a is again a hermetically sealed snap fit in the soft material of the spout 27. Although not illustrated, the valve seat may again carry

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5 a skirt such as 13 in the previously described construction and a handle such as 14 or 14b. The skirt enhances an airtight seal between the valve seat and the inside of the spout and the handle facilitate removal and possibly carries the previously described pin for closing a pin hole air vent against the escape of liquid.

10 Another form of valve according to the invention is illustrated in Figs. 21 to 23. Again, the principle of operation is the same as previously described and therefore the same reference numerals have been used for equivalent parts but with the suffix x.

15 The exploded view of Fig. 21 shows the previously described valve member 1x, the valve holder 4x and the valve seat 11x with upstanding hollow post 16x carrying projections 20x. The valve seat 11x is again carried by a handle 14x, with the aid of which the assembled valve is fitted to the lid 26x of a trainer cup and removed therefrom for cleaning. The lid has a relatively soft spout 27x provided with three apertures 28x (also visible in Fig. 22) through which the child can suck liquid from the cup.

20 The major difference in the construction of the non-spill valve in Figs. 21 and 23 is that the handle 14x also carries a relief or venting valve comprising a thin diaphragm in a hollow diaphragm holder 41, a tubular receptacle 42 for the diaphragm holder 41 and a hollow stopper 43 which is a push fit and preferably a snap fit in the receptacle 42 to trap the diaphragm holder 41 in the receptacle 42. 25 The diaphragm itself is a thin membrane containing a slit 44 (see the underneath view of the Fig. 23 lid).

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As in the embodiment described with reference to Fig. 16, the assembled non-spill valve of Fig. 21 is offered to the lid 26x by grasping the handle 14x and is inserted in the lid 26x. More particularly, with the aid of its bead 22x, the valve seat 11x is a sealing
5 snap fit inside the spout 27x, whereas the receptacle 42 for the diaphragm holder 41 of the relief valve is received with a push fit in a tubular cylindrical socket 46 provided in the lid 26x beneath a pinhole 47 in the soft extension 27'x of the spout material.

10 The ingress of air through the pinhole 47 to facilitate rapid reduction of a vacuum within the trainer cup when the child stops sucking on the spout is permitted by means of the diaphragm or membrane of the diaphragm holder 41. More particularly, when excessive vacuum has built up in the cup, the diaphragm flexes downwardly to open the slit
15 44. After the vacuum has been dissipated, the diaphragm flexes upwardly to close the slit again and prevent undesired spilling.

As has previously been explained, the valve according the invention is particularly suitable as a suction valve for use with trainer cups,
20 spillage being avoided when no suction is applied. The invention extends to trainer cups fitted with such valves and to similar vessels such as baby's bottles. However, the valve is also applicable to flexible vessels and tubes, for example flexible ketchup bottles or toothpaste tubes, where the contents are expressed by deliberately
25 squeezing the bottle or tube and spillage is desired to be prevented when the squeezing pressure is removed.

The invention also extends to such bottles and tubes, in which case the valve is built into the neck or mouth of the container in question.
30 When pressure is exerted, the valve strip is in this case stretched to lift

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off the holes in the valve seat when pressure is applied through the holes from the valve seat side but the valve strip flexes back to close the holes when the pressure is released.

5 The valve of the invention is also applicable as an air vent inlet valve for a container that requires air to be let in when a predetermined vacuum arises within the container. For example the valve of the invention could be provided in the base of a baby's feeding bottle to prevent the creation of excessive suction and yet avoid escape of the
10 liquid contents.

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Claims

1. A valve for liquids or fluent materials comprising a flexible valve member disposed over one or more apertures in a relatively non-flexible valve seat;
5 wherein, when suction is applied to the face of the flexible valve member remote from the valve seat or pressure is applied to the face of the flexible valve member nearest to the valve seat, the flexible valve member will be flexed off the valve seat and permit liquid or fluent material to flow through the or each aperture but the flexible valve member will flex back to lie over and close the or each aperture
10 to seal the same when the suction or pressure is released.
2. A valve as claimed in claim 1, wherein the flexible valve member includes a valve strip that is wrapped about a valve holder or retaining ring surrounding a hollow post in the valve seat, and wherein the hollow post includes the or each
15 aperture.
3. A valve as claimed in claim 2, wherein the flexible valve member includes an anchor portion for securing the flexible valve member to the valve holder.
- 20 4. A valve as claimed in claim 2 or 3, wherein the valve holder is substantially inflexible.
5. A valve as claimed in claim 2, 3 or 4, wherein the valve holder and the flexible valve member form a one-piece whole.
25
6. A valve as claimed in any claim 2 to 5, wherein the valve holder includes a notch for engagement with the valve strip, and wherein anchor portions are held in place by valve holder wall members.

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7. A valve as claimed in any claim 2 to 5, wherein the valve seat includes a channel surrounding the base of the hollow post for engagement with the valve holder and the anchor portion.
- 5 8. A valve as claimed in claim 7, wherein the valve seat and the valve holder mate via a push-fit.
9. A valve as claimed in claim 7, wherein the channel includes a groove for snap-fit engagement with the anchor portion.
- 10 10. A valve as claimed in any preceding claim, wherein the valve seat includes a handle.
11. A valve as claimed in claim 10, wherein the valve is constructed from a plastics material.
- 15 12. A valve as claimed in claim 11, wherein the flexible valve member is constructed from silicone and the valve seat and the valve holder are constructed from a polycarbonate material.
- 20 13. A vessel including a lid incorporating a spout, and a valve as claimed in any previous claim disposed within the lid for regulating the flow of a fluid through the spout.
- 25 14. A vessel including a valve as claimed in any claim 1 to 12.
15. A vessel as claimed in claim 13 or 14, wherein the vessel is a cup, a bottle or a deformable and/or flexible tube-type container.

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16. A cup including a lid incorporating a spout, and a valve as claimed in any claim 1 to 12, wherein the handle includes a pin for releaseably sealing an air vent in the lid.
- 5 17. A cup including a lid incorporating a spout, and a valve as claimed in any claim 1 to 12, wherein the handle includes a guide portion for engaging with a guide channel located on the underside of the lid.
- 10 18. A valve comprising a valve portion and a valve seat in releasable engagement with each other; wherein the valve portion includes a flexible valve member, and the valve seat includes an aperture that is sealed by the flexible valve member in the absence of any applied pressure.
- 15 19. A valve as claimed in claim 18, wherein the flexible valve member is disposed to partially cover a void in the valve portion, and wherein the valve seat mates with the valve portion via the void.
20. A valve as claimed in claim 19, wherein the valve seat includes a protrusion bearing the or each aperture.

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Fig.1.

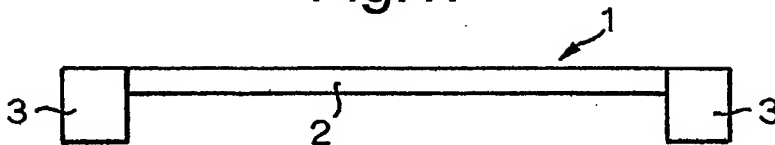


Fig.2.

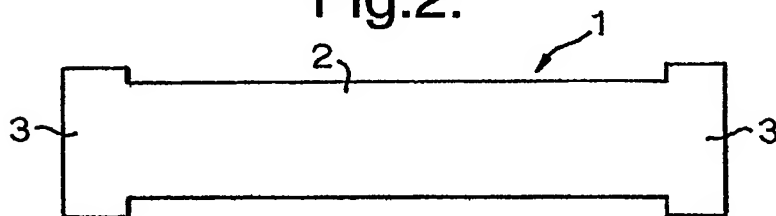


Fig.3.

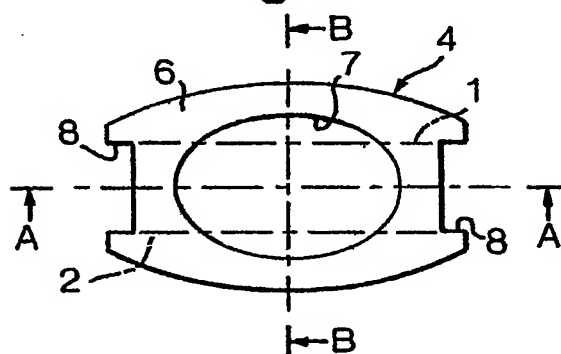


Fig.6.

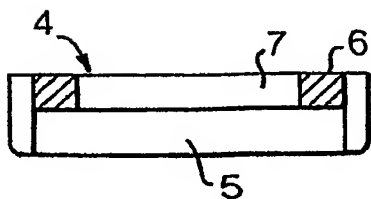


Fig.5.

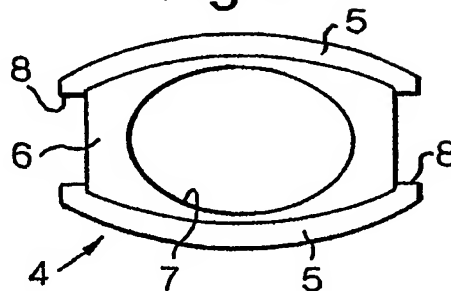


Fig.4.

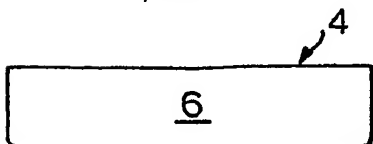
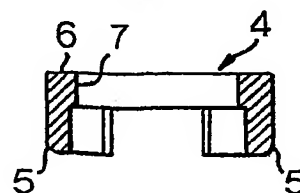


Fig.7.



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Fig.8.

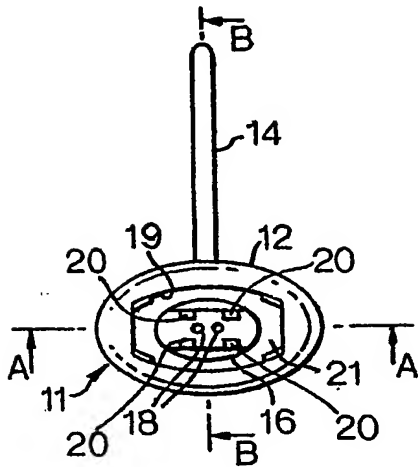


Fig.9.

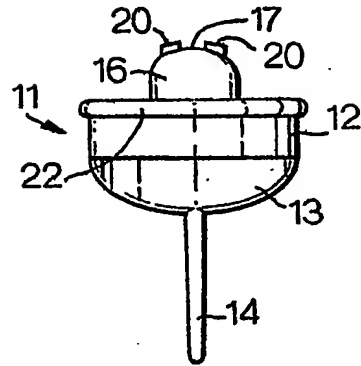


Fig.10.

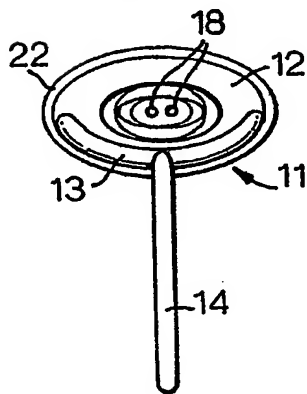


Fig.11.

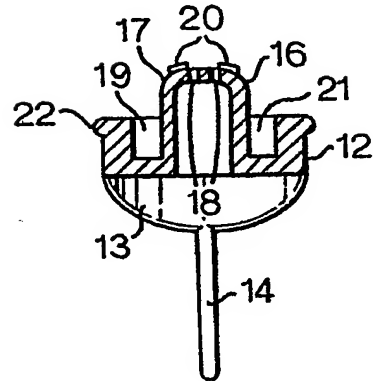
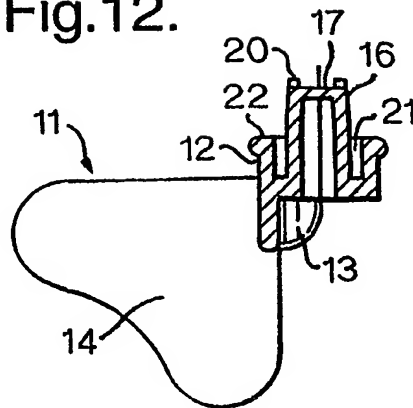


Fig.12.



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Fig.13

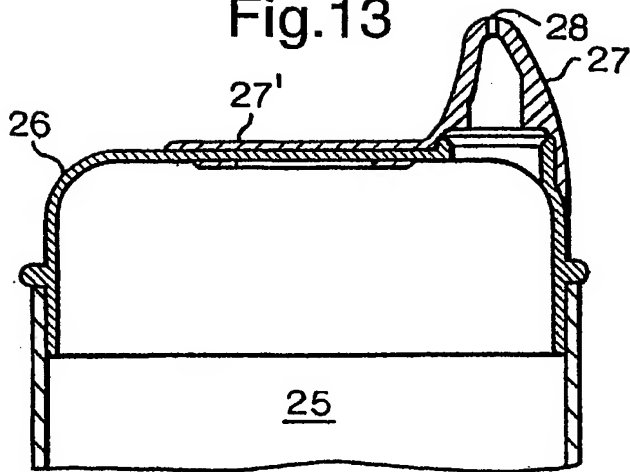


Fig.14

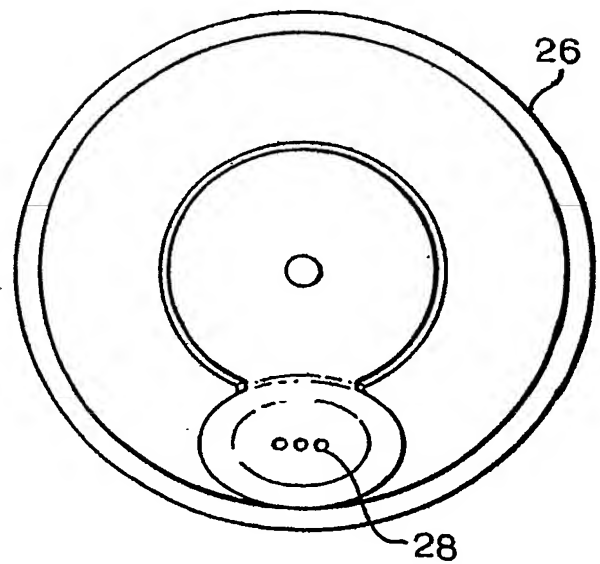


Fig.15

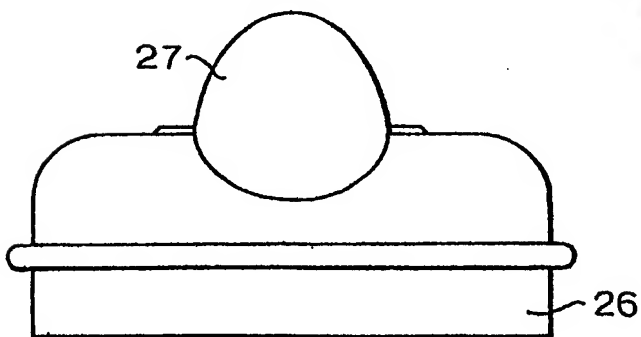


Fig.16

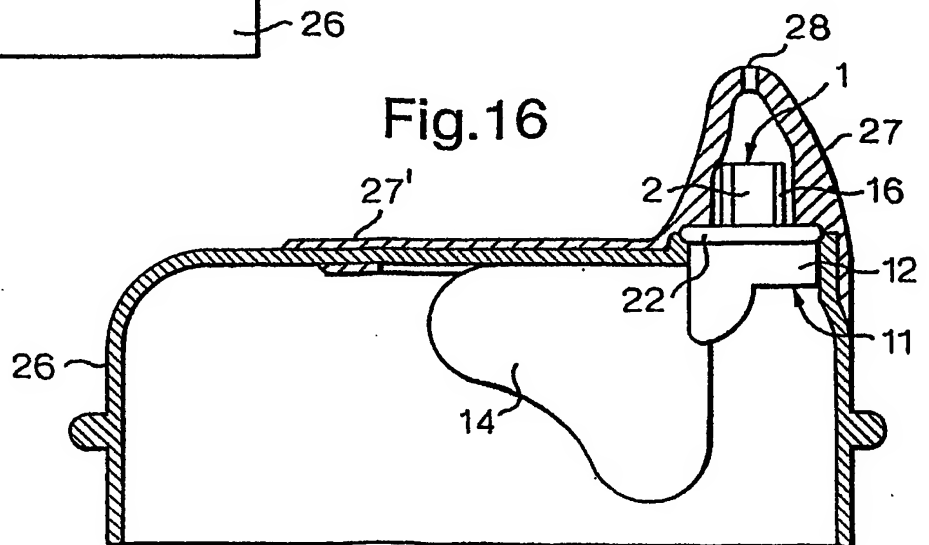


Fig.17

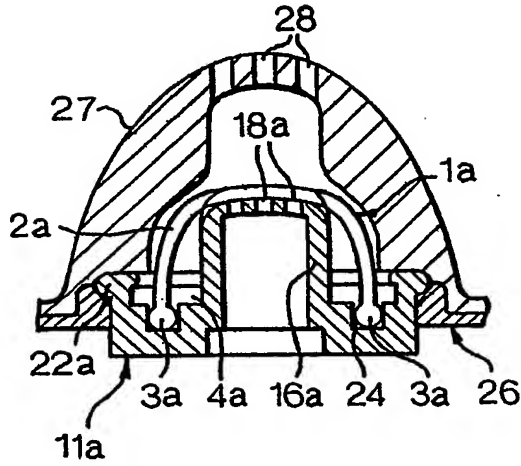


Fig.18.

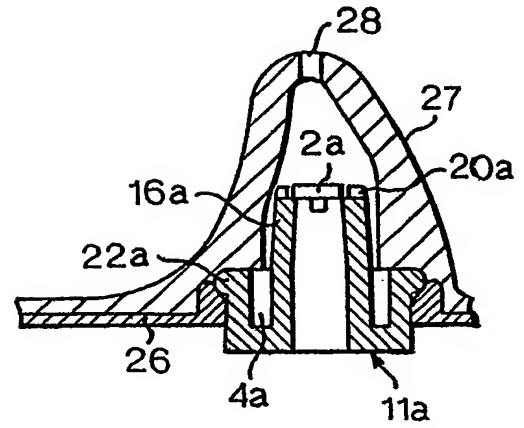


Fig.19.

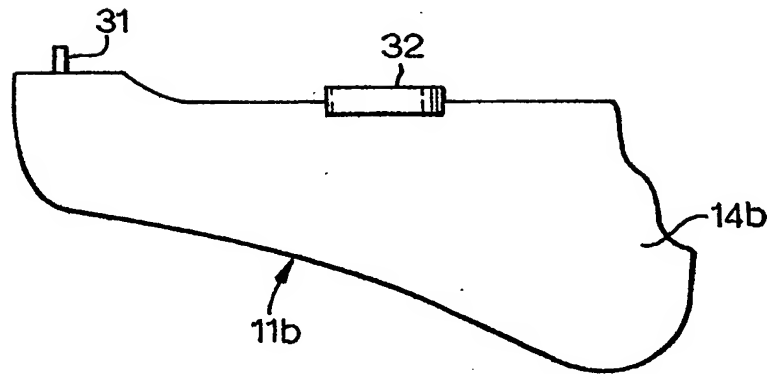
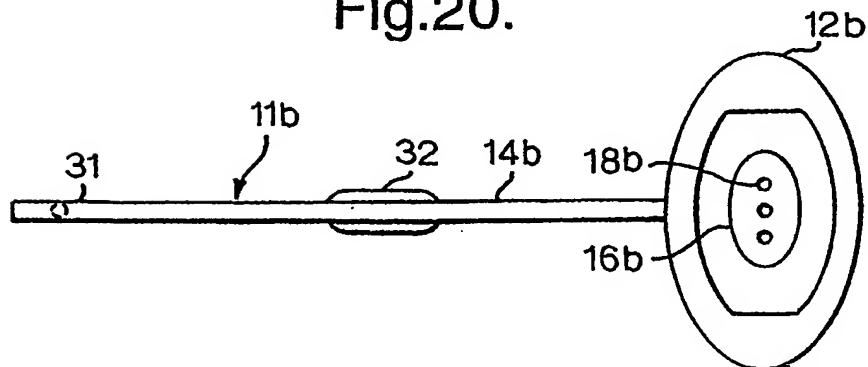


Fig.20.



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Fig.21.

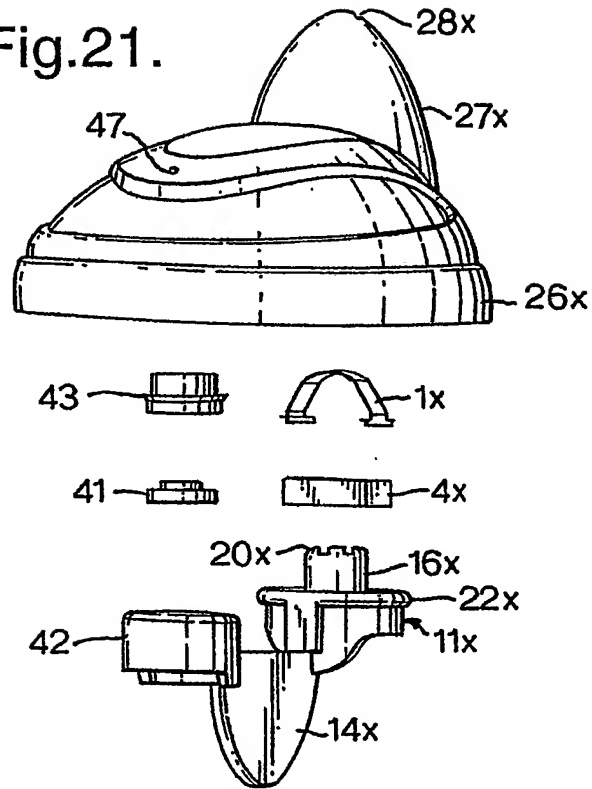


Fig.22.

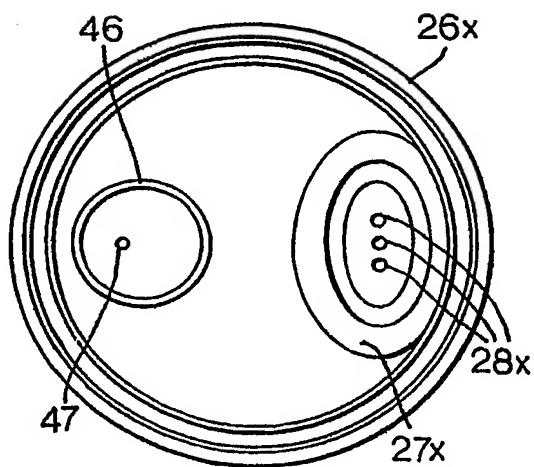
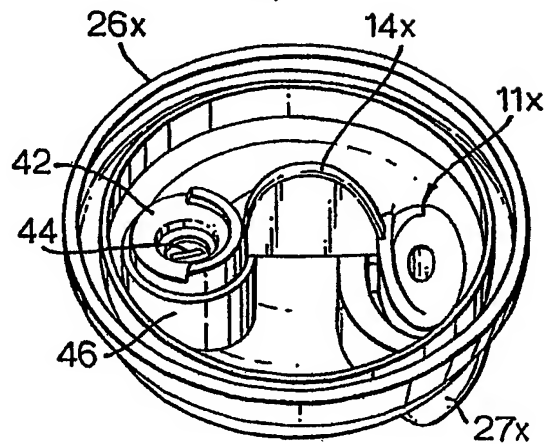


Fig.23.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/02565

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A47G19/22 B65D47/20 F16K15/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 B65D A47G F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	paragraph '0027!; figures 5A, 10A-10C	2
X	US 2001/035420 A1 (ST PIERRE WILLIAM ET AL) 1 November 2001 (2001-11-01)	1, 10, 11, 13-15, 18
Y	figure 2	16
Y	US 4 136 799 A (ALBERT KENNETH J) 30 January 1979 (1979-01-30) column 6, line 21 - line 26; figure 6	16
A	US 2001/020623 A1 (MCDONOUGH ET AL) 13 September 2001 (2001-09-13) paragraph '0046! paragraph '0078! paragraph '0099!; figure 31	12, 17

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

18 September 2003

Date of mailing of the international search report

26/09/2003

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Information on patent family members

International Application No

PCT/GB 03/02565

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